NGSS Awareness

SWAC Discussion
Fall 2013
Gail Hall and Regina Toolin
Agenda

• Hear about the NGSS Shifts

• Discuss ways for implementation of these standards with connections to SWAC principles.
Learning Intentions

Through today’s Discussion, you will have...

• Clarified NGSS **Shifts**;

• Identified **connections** between Science and ELA and Mathematics Common Core State Standards;

• Consider SWAC connections to NGSS.
Foundation for the Framework
Next Generation Science Standards

• Collaborative, state-led process

• Released in April 2013
  – Adopted in VT—June 2013

• Rich and challenging content

• Today’s students & tomorrow’s workforce
Why Now?

Learning Research
Why Now?

Changing Science
Why Now?

Workforce Needs
Why Now?

Societal Needs
All Standards, ALL Students
“Integration of subject areas is an avenue that strengthens science learning for all students, particularly for students who have traditionally been underserved...”

NGSS Appendix D and The Understanding Language Initiative [http://ell.stanford.edu](http://ell.stanford.edu)
Let’s Explore the Architecture
### NGSS Architecture

**MS-LS2 Ecosystems: Interactions, Energy, and Dynamics**

Students who demonstrate understanding can:

**MS-LS2-1.** Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem. (Clarification Statement: Emphasis is on cause and effect relationships between resources and growth of individual organisms and the number of organisms in ecosystems during periods of abundant and scarce resources.)

**MS-LS2-2.** Construct an explanation that predicts pattern of interactions among organisms across multiple ecosystems. (Clarification Statement: Emphasis is on predicting consistent patterns in interactions that frequently occur in different ecosystems in terms of the relationships among and between organisms and abiotic components of ecosystems. Examples of these interactions could include competitive, predatory, and mutually beneficial.)

**MS-LS2-3.** Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem. (Clarification Statement: Emphasis is on describing the conservation of matter and flow of energy into and out of various ecosystems, and on defining the boundaries of the system.)

**MS-LS2-4.** Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations. (Clarification Statement: Emphasis is on recognizing patterns in data and making warranted inferences about changes to ecosystems.)

**MS-LS2-5.** Evaluate competing design solutions for maintaining biodiversity and ecosystem services. (Clarification Statement: Examples of ecosystem services could include water purification, nutrient recycling, and prevention of soil erosion. Examples of design solutions could include scientific, economic, and social considerations.)

### Science and Engineering Practices

**Developing and Using Models**
- Modeling in 6-8 builds on K-5 experiences and coordination between descriptive and predictive models to describe, test, and predict more abstract phenomena and engineering designs.
- Develop a model to describe phenomena. (MS-LS2-3)
- Analyzing and Interpreting Data
- Analyzing data in 6-8 builds on K-5 experiences and progresses to extending quantitative analysis to investigations, distributions between correlation and causation, and basic statistical techniques of data and error analysis.
- Analyzing and interpreting data to provide evidence for an explanation (MS-LS2-3)
- Constructing Explanations and Designing Solutions
- Constructing explanations and designing solutions in 6-8 builds on K-5 experiences and progresses to including more evidence and considering alternative explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories.
- Engaging in Argument from Evidence
- Engaging in argument from evidence in 6-8 builds on K-5 experiences and progresses to constructing a convincing argument from evidence and designing solutions based on jointly developed and agreed-upon criteria.

### Disciplinary Core Ideas

#### LS2.A: Interdependent Relationships in Ecosystems
- Organisms, and populations of organisms, are dependent on their environmental interactions with both other living things and with nonliving factors. (MS-LS2-1)
- In any ecosystem, organisms and populations with similar requirements for food, water, oxygen, or other resources may compete with each other for limited resources, access to which may determine their survival and reproduction. (MS-LS2-1)
- Growth of organisms and population increases are limited by access to resources. (MS-LS2-1)
- Similarily, predator interactions may reduce the number of organisms or eliminate whole populations of organisms. Mutually beneficial interactions, in contrast, may become so interdependent that each organism requires the other for survival. Although the species involved in these competitive, predation, and mutually beneficial interactions vary across ecosystems, the patterns of interactions of organisms with their environments, both living and nonliving, are shared. (MS-LS2-3)

#### LS2.B: Cycles of Matter and Energy Transfer in Ecosystems
- Food webs are models that demonstrate how matter and energy is transferred between producers, consumers, and decomposers as the three groups interact within an ecosystem. Transfer of matter and energy occurs at every level. Decomposers recycle nutrients from dead plant or animal matter back to the soil in terrestrial environments or to the water in aquatic environments. The atoms that make up the organisms in an ecosystem are cycled repeatedly between the living and nonliving parts of the ecosystem. (MS-LS2-3)

#### LS2.C: Ecosystem Dynamics, Functioning, and Resilience
- Ecosystems are dynamic in nature; their characteristics can vary over time. Disruptions to any physical or biological component of an ecosystem can lead to shifts in all its populations. (MS-LS2-4)
- Biodiversity describes the variety of species found in Earth’s terrestrial and aquatic ecosystems. The completeness or integrity of an ecosystem’s biodiversity is often used as a measure of its health. (MS-LS2-5)

### Crosscutting Concepts

#### Patterns
- Patterns can be used to identify cause and effect relationships. (MS-LS2-2)
- Cause and effect relationships may be used to predict phenomena in natural or designed systems. (MS-LS2-1)

#### Energy and Matter
- The transfer of energy can be tracked as energy flows through a natural system. (MS-LS2-3)
- Stability and Change
- Small changes in one part of a system might cause large changes in another part. (MS-LS2-4)

#### Connections to Engineering, Technology, and Applications of Science

#### Influences of Science, Engineering, and Technology on Society and the Natural World
- The use of technologies and any limitations on their use are driven by individual and societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions. Thus technology use varies from region to region and over time. (MS-LS2-3)

### Connections to Nature of Science

#### Scientific Knowledge Is Based on Empirical Evidence
- Science disciplines share common rules of obtaining and evaluating empirical evidence. (MS-LS2-4)

#### Connections to other topics in this grade level will be available on or before April 26, 2013

Common Core State Standards Connections will be available on or before April 26, 2013.
### Performance Expectations

**3-PS2 Motion and Stability: Forces and Interactions**

**3-PS2-a.** Carry out investigations of the motion of objects to predict the effect of forces on an object in terms of balanced forces that do not change motion and unbalanced forces that change motion. (Clarification Statement: An example is pushing on each side of a box on a table, with equal forces, will not produce any motion at all.) (Assessment Boundary: Limit testing to one variable at a time: number, size, or direction of forces. The size and direction of forces should be qualitative. Gravity is only to be addressed as a force that pulls objects down.)

**3-PS2-b.** Investigate the motion of objects to determine when a consistent pattern can be observed and used to predict future motions in the system. (Clarification Statement: An example of motion with a predictable pattern is a child swinging in a swing. In this example, the student could observe the swing moving at different speeds depending on where it is on the arc of the swing.)

**3-PS2-c.** Investigate the effect of electric and magnetic forces between objects not in contact with each other and use the observations to describe their relationships. (Clarification Statement: An example of an electric force could be the force on a bar magnet or an electrically charged balloon. Gravity is only to be addressed as a force that pulls objects down.) (Assessment Boundary: limit forces produced by objects that can be manipulated by students.)

**3-PS2-d.** Apply scientific knowledge to design and refine solutions to a problem by using the properties of magnets and the forces between them. (Clarification Statement: Example problems might be constructing a latch to keep a door shut, or creating a device to keep two moving objects from colliding. Students should understand that the result of a collision results in the loss of kinetic energy.)

### Science and Engineering Practices

<table>
<thead>
<tr>
<th>Asking Questions and Defining Problems</th>
<th>Disciplinary Core Ideas</th>
<th>Crosscutting Concepts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asking and defining problems in grades 3-5 builds from grades K-2 experiences and connections to specific phenomena.</td>
<td>Forces and Motion: Each force acts on a particular object and has both strength and direction. As an object moves at a constant velocity in a straight line, the forces on the object cancel each other. (3-PS2-a) (3-PS2-c)</td>
<td>Causation and Effect: Cause and effect relationships are routinely identified, tested, and used to make changes. (3-PS2-a) (3-PS2-c)</td>
</tr>
<tr>
<td>Planning and carrying out investigations to answer questions or test solutions to problems in 3-5 builds on K-2 experiences and connections to include investigations that control variables and provide evidence to support explanations or design solutions.</td>
<td>PS2A: Forces and Motion</td>
<td>Stability and Change: Change is measured in terms of differences over time and may occur at different rates. (3-PS2-b)</td>
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<td>Connection Box</td>
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### Connections to Nature of Science

- **Scientific Investigations Use a Variety of Methods**
  - Science investigations use a variety of tools and techniques. (3-PS2-b) (3-PS2-c) (3-PS2-d) (3-PS2-a)
  - There is not one scientific method. (3-PS2-b) (3-PS2-a) (3-PS2-c)

- **Constructing Explanations and Designing Solutions**
  - Constructing explanations and designing solutions in grades 3-5 builds on K-2 experiences and connections to include investigations that control variables and provide evidence to support explanations or design solutions.

- **Connection to Engineering, Technology, and Applications of Science**
  - Connections to Engineering, Technology, and Applications of Science
    - Independence of Science, Engineering, and Technology: Tools and instruments (e.g., rulers, balances, thermometers, graduated cylinders, telescopes, microscopes) are used in scientific exploration to gather data and help answer questions about the natural world. Engineering design can develop and improve such technologies. (3-PS2-d)
    - Scientific discoveries about the natural world can often lead to new and improved technologies, which are developed through the engineering design process. (3-PS2-d)
Performance Expectations

K-PS2 Motion and Stability: Forces and Interactions

Students who demonstrate understanding can:

K-PS2-1. Plan and conduct an investigation to compare the effects of different strengths or different directions of pushes and pulls on the motion of an object. [Clarification Statement: Examples of pushes or pulls could include a string attached to an object being pulled, a person pushing an object, a person stopping a rolling ball, and two objects colliding and pushing on each other.] [Assessment Boundary: Assessment is limited to different relative strengths or different directions, but not both at the same time. Assessment does not include non-contact pushes or pulls such as those produced by magnets.]

K-PS2-2. Analyze data to determine if a design solution works as intended to change the speed or direction of an object with a push or a pull.* [Clarification Statement: Examples of problems requiring a solution could include having a marble or other object move a certain distance, follow a particular path, and knock down other objects. Examples of solutions could include tools such as a ramp to increase the speed of the object and a structure that would cause an object such as a marble or ball to turn.] [Assessment Boundary: Assessment does not include friction as a mechanism for change in speed.]
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<tr>
<td>Planning and Carrying Out Investigations</td>
<td>PS2.A: Forces and Motion</td>
<td>Cause and Effect</td>
</tr>
</tbody>
</table>
| Planning and carrying out investigations to answer questions or test solutions to problems in K–2 builds on prior experiences and progresses to simple investigations, based on fair tests, which provide data to support explanations or design solutions. | • Pushes and pulls can have different strengths and directions. (K-PS2-1)  
• Pushing or pulling on an object can change the speed or direction of its motion and can start or stop it. (K-PS2-1)  
• When objects touch or collide, they push on one another and can change motion. (K-PS2-1)  
• A bigger push or pull makes things go faster. (secondary to K-PS2-1)  
• A situation that people want to change or create can be approached as a problem to be solved through engineering. Such problems may have many acceptable solutions. (secondary to K-PS2-1) | • Simple tests can be designed to gather evidence to support or refute student ideas about causes. (K-PS2-1)  
• (K-PS2-2) |
| Analyzing and Interpreting Data | PS2.B: Types of Interactions | |
| Analyzing data in K–2 builds on prior experiences and progresses to collecting, recording, and sharing observations. | • Analyze data from tests of an object or tool to determine if it works as intended. (K-PS2-2) | |

**Connections to Nature of Science**

Scientific Investigations Use a Variety of Methods

- Scientists use different ways to study the world. (K-PS2-1)

**Connections to other DCIs in kindergarten:** K.ETS1.A (K-PS2-2); K.ETS1.B (K-PS2-2)

**Articulation of DCIs across grade-bands:** 2.ETS1.B (K-PS2-2); 3.PS2.A (K-PS2-1), (K-PS2-2); 3.PS2.B (K-PS2-1); 4.PS3.A (K-PS2-1); 4.ETS1.A (K-PS2-2)

**Common Core State Standards Connections:**

**ELA/Literacy –**

RI.K.1 With prompting and support, ask and answer questions about key details in a text. (K-PS2-2)

W.K.7 Participate in shared research and writing projects (e.g., explore a number of books by a favorite author and express opinions about them). (K-PS2-1)

SL.K.3 Ask and answer questions in order to seek help, get information, or clarify something that is not understood. (K-PS2-2)

**Mathematics –**

MP.2 Reason abstractly and quantitatively. (K-PS2-1)
Conceptual Shifts
Conceptual Shifts

1. Interconnected Nature of Science
   - PEs are not Curriculum!
   - Coherent progression of concepts K-12.
   - Deeper content understanding and application
   - Integration of Science and Engineering
   - CCR Preparation
   - Aligned to CCSS in ELA and Mathematics
NGSS will require contextual application of the three dimensions by students.
Interconnected Domains...
Conceptual Shifts

1. Interconnected nature of Science

2. **PEs are not Curriculum!**


4. Deeper content understanding and application

5. Integration of Science and Engineering

6. CCR Preparation

7. Aligned to CCSS in ELA and Mathematics
A Standard Addressing Earth/Space Systems

MS-ESS2 Earth’s Systems

Students who demonstrate understanding can:

MS-ESS2-1. Develop a model to describe the cycling of Earth’s materials and the flow of energy that drives this process. [Clarification Statement: Energy is the process, within the environment, by which materials are transported to form minerals and rocks through the cycling of Earth’s materials. [Assessment Boundary: Assessment does not include the identification and naming of minerals.]

MS-ESS2-2. Construct an explanation based on evidence processes have changed Earth’s surface at varying time and spatial scales. [Clarification Statement: Emphasis is on how processes change Earth’s surface at time and spatial scales that can be large (such as slow plate motions or the uplift of large mountain ranges) or small (such as wind, landslides, or movements of glaciers).]

MS-ESS2-3. Analyze and interpret data on the distribution of fossil fuels, rocks, and rock structures, and seafloor spreading structures to provide evidence that the past plate motions of the past plate tectonic history. [Clarification Statement: Evidence includes the distribution of large rock formations and the locations of ocean structures such as ridges, fault zones, and trenches.]

MS-ESS2-4. Develop a model to describe the cycling of water through Earth’s systems driven by energy from the sun and the force of gravity. [Clarification Statement: Emphasis is on how water changes its state as it moves through the multiple pathways of the water cycle. Examples of models can be conceptual or physical. [Assessment Boundary: Assessment does not include the identification or naming of water or the water cycle.]

MS-ESS2-5. Collect data to provide evidence for how the motions and complex interactions of air masses results in changes in weather conditions. [Clarification Statement: Emphasis is on how the way energy moves in the air masses affect weather conditions.]

MS-ESS2-6. Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates. [Clarification Statement: Emphasis is on how patterns of atmospheric and oceanic circulation are driven by the rotation of the Earth.]

Science and Engineering Practices

Developing and Using Models
- Developing models to build on the experiences and understandings about the environment. [MS-ESS2-5]
- Developing and using models to describe phenomena. [MS-ESS2-5]
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Planning and Carrying Out Investigations
- Planning and carrying out investigations in 6-8 builds on K-5 experiences and progresses to include the investigation of multiple elements of different systems in a wide range of contexts. [MS-ESS2-3]

Analyzing and Interpreting Data
- Analyzing data in 6-8 builds on K-5 experiences that emphasize understanding and developing key scientific and engineering concepts. [MS-ESS2-3]
- Analyzing and interpreting data to provide evidence for phenomena. [MS-ESS2-3]

Constructing Explanations and Designing Solutions
- Constructing explanations and designing solutions in 6-8 builds on K-5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories. [MS-ESS2-3]

Disciplinary Core Ideas

ESS.L: The History of Planet Earth
- Trace the history of Earth’s surface and structure change.

ESS.L: Earth’s Materials and Systems
- All Earth’s processes are the result of the movements of matter and energy within and among the planets’ systems. [MS-ESS2-4]
- The systems interact with each other and with the surrounding environment. [MS-ESS2-5]
- Earth’s surface is constantly changing due to weathering and climate change. [MS-ESS2-5]

ESS.L: Earth’s Surface Processes
- Water cycles involve the movement of water in and out of the atmosphere, on land, and across the ocean. [MS-ESS2-4]
- The movement of water on Earth is controlled by the movement of water on the Earth. [MS-ESS2-4]
- The movement of water on the Earth is controlled by the movement of water on the Earth. [MS-ESS2-4]

ESS.L: Weather and Climate
- Weather patterns and climate processes influence the movement of water on Earth. [MS-ESS2-5]
- The ocean exerts a major influence on weather and climate. [MS-ESS2-5]

Crosscutting Concepts

Patterns
- Patterns in various processes and other numerical relationships can provide information about natural and human-designed systems. [MS-ESS2-5]

Cause and Effect
- Cause and effect relationships can be used to explain phenomena in natural and designed systems. [MS-ESS2-5]

Scale, Proportion, and Quantity
- Time, space, and energy phenomena can be observed at various scales using various tools. [MS-ESS2-5]

Systems and System Models
- Systems can be represented using models and their interactions—such as inputs, processes, and outputs. [MS-ESS2-5]

Stability and Change
- Explanations of stability and change in natural or designed systems can be constructed by students to describe the relationship between the system and its environment at different scales, including the atomic scale. [MS-ESS2-5]

April 2013

NGSS Release
Instructional Scaffolding for a Standard

MS-ESS2

- Earth Systems
A Sample Performance Expectation

MS-ESS2-2

--Construct an explanation
--based on evidence
--for how geoscience processes have changed Earth’s surface
--at varying time and spatial scales.
Prior Learning...

• What content will students need to understand before instruction of this PE?

  – Cycling of Matter (Gr 5 LS2-1)
  – Cycling of Earth’s Materials (MS-ESS2-1)
  – Cycling of Energy (Gr 5 PS3-1 and MS-ESS2-1)
  – Sustainability of Earth’s resources (Gr 5 ESS3-1)
  – Ecosystems are dynamic (Cross Cutting Concept—Stability and Change)
  – Engaging in Argument from Evidence (Practice #7)
After Instruction...

• What content will students need to understand to demonstrate proficiency in this PE?

  – The planet’s systems interact over a variety of scales.

  – The scales of these interactions range from fractions of a second to billions of years.

  – Interactions of the planet’s systems have shaped the earth’s history and will determine its future.
2 Crosscutting Concepts

• What Cross-Cutting Concepts could be addressed during the instruction of this PE?
  --Patterns
  --Cause and Effect
  --Energy and Matter
  --Stability and Change

Effects of Irene in Vermont
What are some learning opportunities you might provide that would support this standard?

- Investigations
- Reading activities
- Use of technology—simulations
- Data analysis opportunities
- On-line Resources
Time to Turn and...
Conceptual Shifts

1. Interconnected nature of Science
2. PEs are not Curriculum!
3. **Coherent progression of concepts K-12.**
4. Deeper content understanding and application
5. Integration of Science and Engineering
6. CCR Preparation
7. Aligned to CCSS in ELA and Mathematics
3 Learning Progression

- K--Weather Conditions
  - 1--Seasons
- 2--Water on Earth—solid or liquid
- 3--Predict Weather Conditions
  - 4—Weathering -- ice, water, wind
- 5--Water on Earth—distribution
- MS--Cycling of Water —Earth’s systems
- HS-- Properties of Water—Effects on Earth

NGSS—Appendix E
Interconnected nature of Science

PEs are not Curriculum!

Coherent progression of concepts K-12.

**Deeper content understanding and application**

Integration of Science and Engineering

CCR Preparation

Aligned to CCSS in ELA and Mathematics
Improved Cognitive Science

• ...the focus is on the core ideas —not necessarily the facts that are associated with them.

• The facts and details are important evidence, but not the sole focus of instruction.

NGSS Appendix A; Conceptual Shifts
4 Improved Cognitive Science

Less...

• Focus on eradicating misconceptions
• Inquiry as activity
• Science as just a body of knowledge
• Only older children able to learn science

More...

• Building on naïve conceptions
• Integrated learning that embodies how one does and learns science
• Science as content learned through practices
• Young children are quite capable and interested in science.
Conceptual Shifts

1. Interconnected nature of Science
2. PEs are not Curriculum!
4. Deeper content understanding and application
5. Integration of Science and Engineering
6. CCR Preparation
7. Aligned to CCSS in ELA and Mathematics
Science and Engineering Practices

1. Asking questions (for science) and defining problems (for engineering)
2. Developing and using models
3. Planning and carrying out investigations
4. Analyzing and interpreting data
5. Using mathematics and computational thinking
6. Constructing explanations (for science) and designing solutions (for engineering)
7. Engaging in argument from evidence
8. Obtaining, evaluating, and communicating information

NGSS—Appendix F: Science and Engineering Practices
What Constitutes a Problem?

A problem is... a situation that people want to change.
Engineering Design Opportunities...

Define

Optimize

Develop Solutions
Is This Engineering?

A Vermont Story...
Conceptual Shifts

1. Interconnected nature of Science
2. PEs are not Curriculum!
4. Deeper content understanding and application
5. Integration of Science and Engineering
6. CCR Preparation
7. Aligned to CCSS in ELA and Mathematics
A benchmark score is the minimum score needed on an ACT subject-area test to indicate a 50% chance of obtaining a B or higher or about a 75% chance of obtaining a C or higher in the corresponding credit-bearing college course.
College and Career Readiness Criteria

• **Analyze** given information when presented with new, complex information.
• Employ **self-directed planning**, monitoring, and evaluation.
• Apply and **compare knowledge across various disciplines**.
• Employ valid and reliable **research strategies**.
• Apply **mathematics and disciplinary literacy skills** to science.
Conceptual Shifts

1. Interconnected nature of Science
2. PEs are not Curriculum!
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7. Aligned to CCSS in ELA and Mathematics
Common Core Connections...

- Mathematical Thinking
- Reading
- Writing
- Vocabulary
- Speaking and Listening
Common Core Connections

**Math**
- **M1**: Make sense of problems and persevere in solving them
- **M2**: Reason abstractly & quantitatively
- **M6**: Attend to precision
- **M7**: Look for & make use of structure
- **M8**: Look for & make use of regularity in repeated reasoning
- **M4**: Models with mathematics
- **M5**: Use appropriate tools strategically
- **E6**: Use technology & digital media strategically & capably
- **E1**: Demonstrate independence in reading complex texts, and writing and speaking about them
- **E7**: Come to understand other perspectives and cultures through reading, listening, and collaborations

**Science**
- **S1**: Ask questions and define problems
- **S3**: Plan & carry out investigations
- **S4**: Analyze & interpret data
- **S6**: Construct explanations & design solutions
- **S2**: Develop & use models
- **S5**: Use mathematics & computational thinking
- **M3 & E4**: Construct viable arguments and critique reasoning of others
- **S7**: Engage in argument from evidence
- **E3**: Obtain, synthesize, and report findings clearly and effectively in response to task and purpose
- **S8**: Obtain, evaluate, & communicate information

**ELA**
- **Commonalities Among the Practices in Science, Mathematics and English Language Arts**
- Based on work by Tina Chuek ell.stanford.edu
What’s Next for Vermont...

CCSS Connections

Pacing the Transition

Developing Curriculum

Building Capacity

Sharing Online

http://ve2.vermont.gov/
Your Questions...
Your Feedback....

• Please help us out further by answering these questions.

1. What do you find most exciting about NGSS?

2. What further support will you need to move forward with your understanding of NGSS?

Thank you!
## Comparison: Science and Engineering Practices

<table>
<thead>
<tr>
<th>National Science Education Standards Practices (from NSES)</th>
<th>NGSS Science and Engineering Practices</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asking scientific questions... and structuring...testable predictions</td>
<td>1. Defining Problems</td>
</tr>
<tr>
<td>Using scientific knowledge to construct models</td>
<td>2. Developing and using models</td>
</tr>
<tr>
<td>Collecting data to address scientific questions and to support predictions</td>
<td>3. Planning and carrying out investigations</td>
</tr>
<tr>
<td>Searching for regularities and patterns in observation and measurements (i.e. data analysis)</td>
<td>4. Analyzing and interpreting data</td>
</tr>
<tr>
<td>Using mathematical reasoning and quantitative applications to interpret and analyze data to solve problems</td>
<td>5. Using mathematical and computational thinking</td>
</tr>
<tr>
<td>Using evidence and scientific explanations, models and representations.</td>
<td>6. Constructing explanations and designing solutions</td>
</tr>
<tr>
<td>Using evidence to construct scientific explanations</td>
<td>7. Engaging in argument from evidence</td>
</tr>
<tr>
<td></td>
<td>8. Obtaining, evaluating, and communicating information</td>
</tr>
</tbody>
</table>